ELEC 391 – Final Project

Summer 2025

Self-Balancing Robot

Bare Minimum Requirements:

1. The robot must be capable of autonomous self-balancing while stationary, i.e. remaining upright in place with minimal oscillation for at least **30 seconds**. Lateral oscillations should stay within **±4 cm** and the robot should be considered roughly stationary (average movement speed < **1 cm/s**).

2. The robot must be controlled externally using wireless (Bluetooth) signal. Four controls (forward, backward, turn left, turn right) must be implemented:
    - Start from pause.
    - Move forward, then pause.
    - Move backwards, then pause.
    - Turn left 45°, pause, turn left again 45°, pause (90° turn).
    - Turn right 45°, pause, turn right again 45°, stop (return to original spot).

3. The robot must maintain balance while being remotely controlled via Bluetooth on a flat surface for at least **50 cm** in each direction (**forward and backward**) at a speed of at least **10 cm/second**, without falling.

4. The robot must be able to maintain balance while taking turns on a flat surface. Each 45° turn must be completed in no more than **2 seconds**.

5. The robot must be able to move up, stay stationary, and move down a ramp with an angle of at least **15°**.